

## 4. Consumption Analysis

### Historical Data

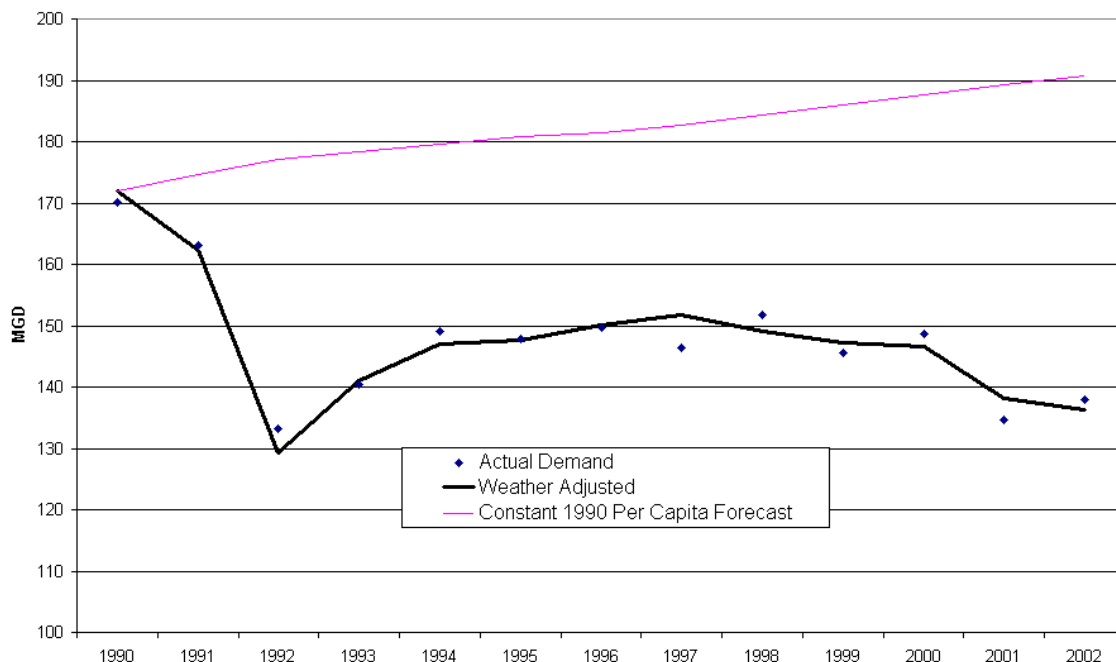
To put the 2002 experience into context and better understand the Saving Water Partnership's program performance in 2002, a review of historical water use patterns is useful. The years 1992, 2001 and 2002 produced three "drought" responses in the last 10 years. These years exhibit peculiar water use patterns in that customers were asked to temporarily curtail their water use. In 1992, water use was severely restricted, and drought actions included a mandatory ban on lawn watering. In contrast during 2001, customers were only asked to voluntarily reduce their water use by 10%. Again in late 2002 customers were asked to voluntarily reduce their use, but not given a numerical target to shoot for. Table 16 compares 2002 and 2001 to the previous drought and the 1994-2000 average water use.

**Table 16: Recent and Historical Demand**

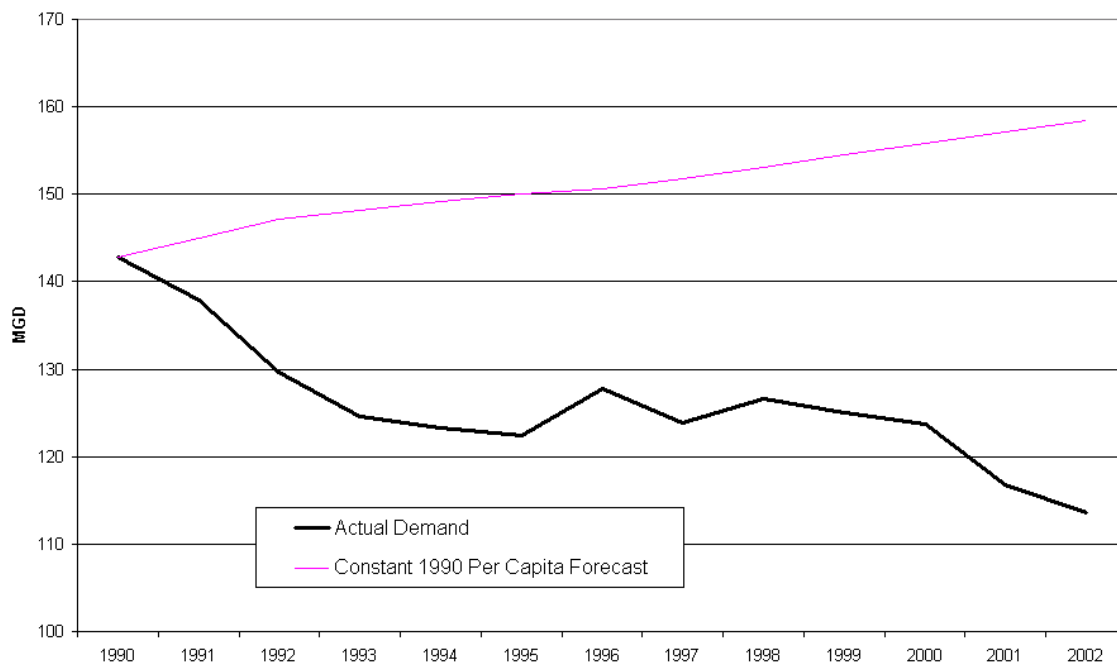
	2002	2001	'94-'00 Avg	1992
Average Annual Daily Demand - MGD	137	135	148	132
Average Summer Daily Demand - MGD	172	159	182	137
Average Winter Daily Demand - MGD	112	117	125	129
Annual Per Capita Daily Demand – GPD Per Person	102	101	117	108

Consumption in 2002 closely followed the pattern of decreased use seen in 2001. Warmer drier summer weather contributed to higher summer use but this was offset by lower winter use so that average annual use was not increased significantly. While average annual use in 2001 was slightly higher than in 1992, use per person was lower than the more extreme drought of 1992. The following Charts illustrate how demand has changed historically.

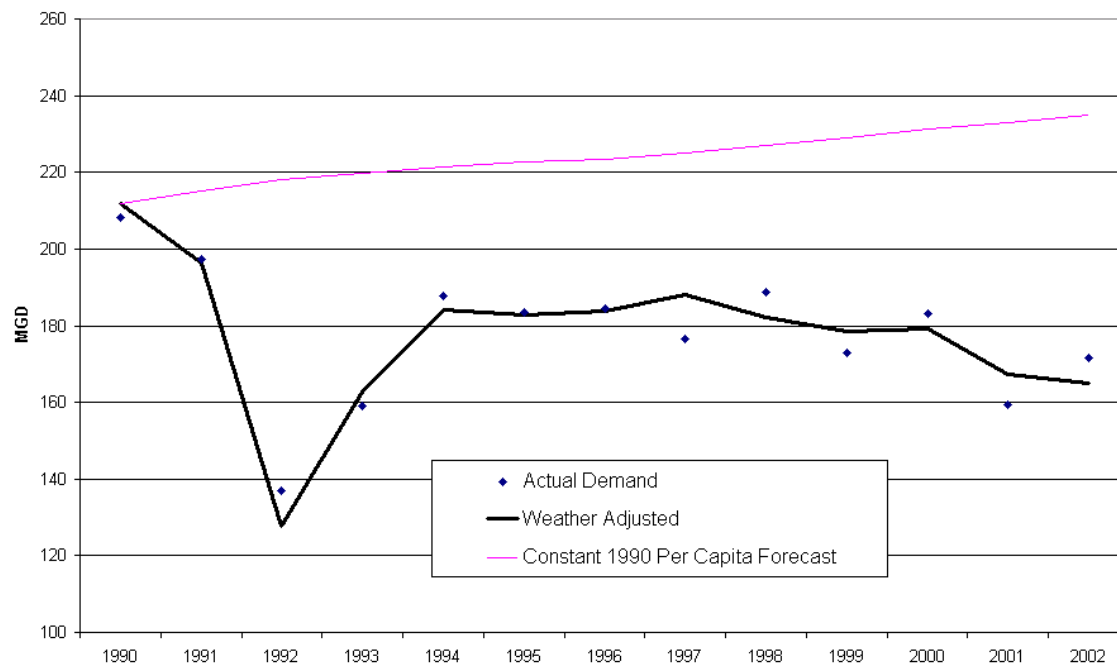
**Chart 5: Regional Annual Average Water Demand**



**Chart 6: Regional Winter Water Demand**



**Chart 7: Regional Summer Water Demand**



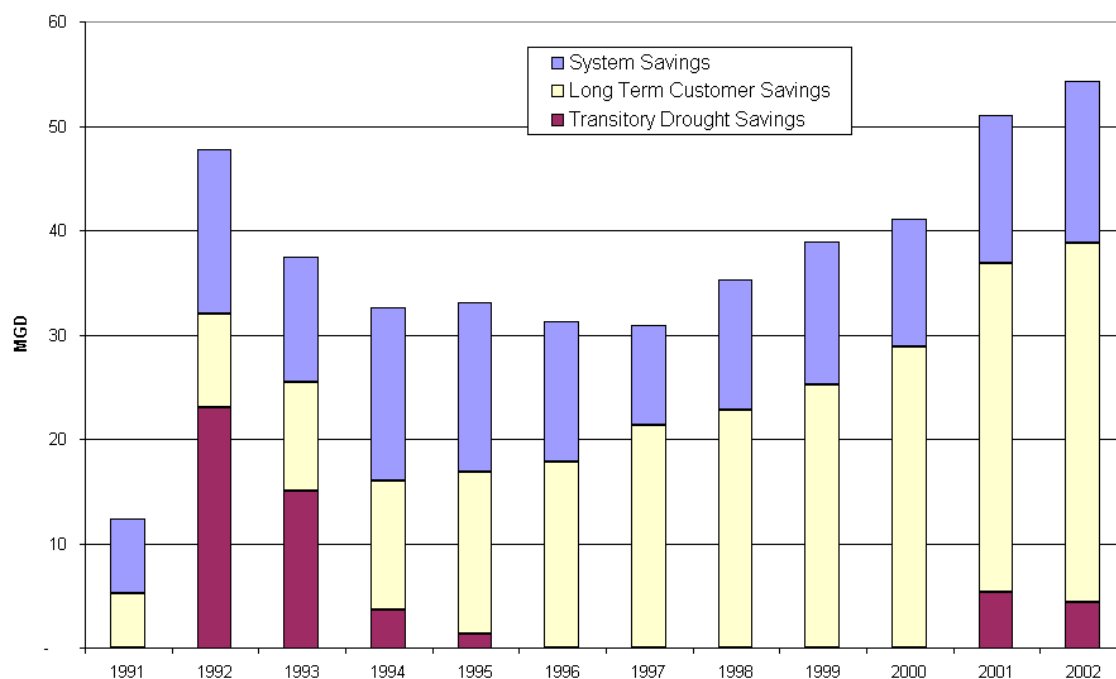
Two things to note in Charts 5, 6 and 7: first, a demand “projection” using constant per capita use (equal to 1990 per capita use) -- the upper line -- is compared to actual demand. Second, the weather’s year-to-year effect on demand has been accounted for using a regression model to adjust actual demand to a level associated with “normal” weather. This model “normalizes” demand -- downward in a year that had a hot, dry summer, and upward when there was a cool, wet summer. For instance, because 2002 experienced a warm and very dry summer, “weather-adjusted” demand in 2002 is somewhat lower than actual demand in 2002. The weather-adjusted demand is the solid black line.

Average annual water use has departed steadily from constant per capita demand since the mid-1990’s. Summer water demand has fallen significantly from the 1990 level of about 210 MGD. The reduction in water use in 1992 was nearly to the level of early 1990’s winter-time demands. After re-bounding in 1993 and 1994, summer demand has remained at about 180 MGD, until the drought of 2001. The reduction in 2001 was not as severe as 1992, falling from a lower initial level, and not falling to the low 1992 levels. Unlike 1992, customers continued to irrigate in 2001 without mandatory lawn watering restrictions, albeit less than during a typical summer in the late 1990’s. A warm and very dry summer in 2002 caused actual summer demand to increase from 2001 actual demand. However, this increased use was still below average summer consumption in 2000 and before, and when adjusted for weather, represents a continued decline in summer demand. Regarding winter demand, 2002 continued the steep decline in winter use visible since 2000. The three main factors contributing to the decline are the 1% Program, drought curtailment, and a regional economic downturn.

## Conservation Savings

Chart 8 depicts the sources of historically achieved water savings, defined as the difference between the constant per capita demand forecast and the weather adjusted actual demand in each year. Total savings in Chart 8 correspond to the growing difference between the “constant per capita” line and the “weather adjusted actual” line in the Average Annual Demand Charts 5, 6 and 7 above.

**Chart 8: Cumulative Annual Water Savings since 1990**



System savings (the top bar) are reductions in non-revenue water use. After the initial savings in 1991 and 1992, system savings have not increased over time, fluctuating from year to year, but averaging about 12 MGD. (In the coming years system savings should grow by another 3 MGD on average as in-town Seattle reservoirs are covered.)

On the other hand, long-term customer savings including rate and code effects, (the middle bar) have grown steadily to nearly 40 MGD in 2002.

The bottom bar shows transitory savings from the 1992, 2001, and 2002 drought curtailments. The 1992 transitory drought curtailment savings diminished and finally disappeared after about four years. It is expected that the transitory curtailment savings from 2001 will gradually diminish over the next few years, in a fashion similar to 1992. However, the nature of the latest transitory savings is different than 1992. In 2002, transitory savings included not only drought carry-over from 2001, but also the effects of the local economic downturn, estimated to be 1.7 MGD of the total 6 MGD transitory savings. Since peaking in 2000, regional employment declined 1% in 2001 and 2.7% in 2002. This was the first time total employment in the Puget Sound region had fallen since 1982. The estimated impact of this employment decline was to reduce water demand half a million gallons per day in 2001 and an additional 1.7 MGD in 2002. In addition, the 2002 transitory savings are smaller than in 1992 because the curtailment was voluntary rather than mandatory.

Table 17 shows estimates of the sources of savings in 2002, over and above the cumulative long-term savings achieved through 2001. The savings are for “weather adjusted” demands. The weather regression model estimates that actual demand in 2002 was about 1.5 MGD higher than normal weather demand, reflecting the warm and very dry summer.

**Table 17: Estimates of Savings**

	<b>New Savings in 2002</b>
Transitory Drought Curtailment and Economic Slowdown	4.0 MGD
Transitory Above-normal Non-revenue Savings	2.0 MGD
New Long-term Customer Savings	2.8 MGD
<b>Total New 2002 Savings</b>	<b>8.8 MGD</b>

Based on the 1992 experience, the 4 MGD of transitory drought curtailment savings will gradually diminish and the 2 MGD of above-normal non-revenue savings will not be sustained in 2003 and beyond.

Table 18 gives further detail on the sources of 2002 conservation savings. Long-term savings include savings that would come from higher water rates and plumbing fixture codes, without the 1% Program. The other sources of long-term savings includes both the direct and indirect impacts from incentives, education and promotion of the 1% Program – these savings are the focus of this report's other sections.

Transitory savings come from above-normal system (non-revenue) savings and from temporary drought curtailment actions, as well as 2002's temporary slowing of economic activity in the regional service area.

**Table 18: New Water Savings Achieved in 2002 (MGD)**

	New Long-Term Customer Savings						Transitory Savings			Total <sup>6</sup>
	1% Conservation Program		Rates	Code	Seattle Low Income <sup>3</sup>	Total	Curtailment & Economy <sup>4</sup>	System	Total	
	Hardware <sup>2</sup>	Behavior								
Residential Indoor <sup>1</sup>	0.28	0.1	0.3	0.5	0.3	1.5	0.7	-	0.7	2.1
Residential Landscape	<0.01	0.3	0.1	-	-	0.4	0.6	-	0.6	1.0
Commercial Domestic	0.04	0.2	0.0	0.3	-	0.5	0.9	-	0.9	1.4
Commercial Process	0.15	0.1	0.1	-	-	0.4	1.6	-	1.6	2.0
Commercial Landscape <sup>1</sup>	0.01	<0.1	<0.1	-	-	0.1	0.2	-	0.2	0.3
2002 Total <sup>7</sup>	0.5	0.7	0.5	0.8	0.3	2.8	4.0 <sup>5</sup>	2.0	6.0	8.8

<sup>1</sup>Includes Multifamily

<sup>2</sup>Savings from fixture replacement and equipment upgrade programs can be measured with greater precision than other sources of savings in this table.

<sup>3</sup>Seattle low-income savings are separate from and in addition to the 1% Program as required by Seattle Ordinance 120532. These savings resulted from toilet retrofits completed in low-income housing in 2002.

<sup>4</sup>Includes impact of curtailment carry-over from 2001 drought (2.3 MGD) and temporarily depressed economic conditions (1.7 MGD) in 2002.

<sup>5</sup>4.0 MGD in 2002 indicates that 1 MGD of the 2001 transitory savings has eroded and that 4 MGD of transitory savings are still expected to erode as time passes.

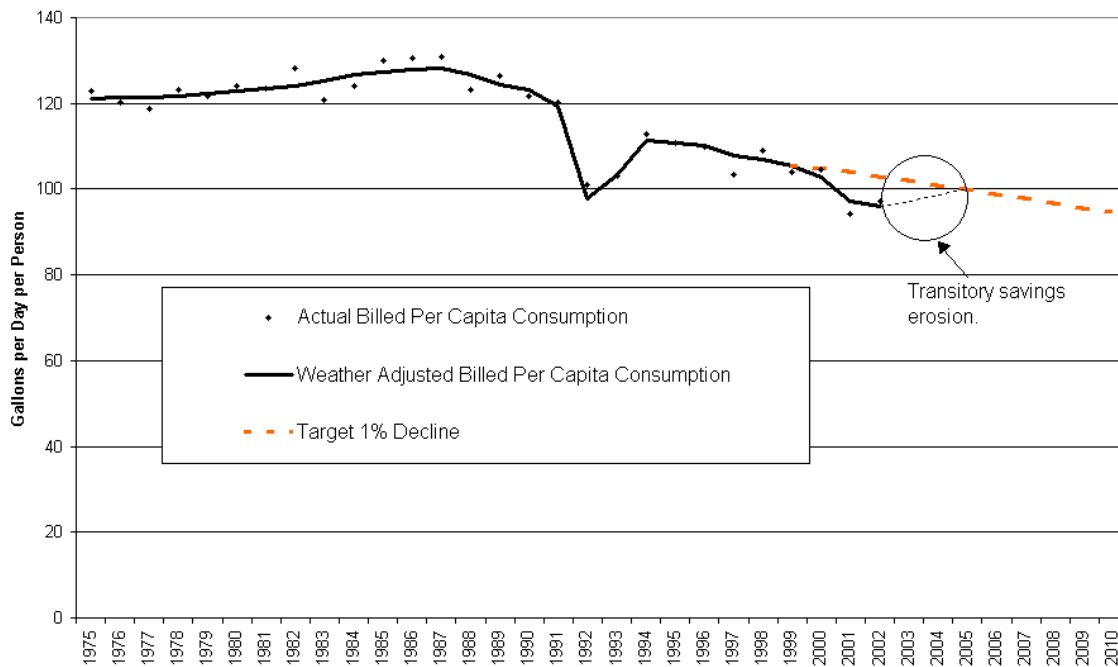
<sup>6</sup>Savings are weather-adjusted from 2002 forecast.

<sup>7</sup>Some totals may not add due to rounding.

The savings breakout in Table 18 was estimated as follows: Rates – price elasticity parameters from SPU’s econometric model forecast; Code – natural replacement of plumbing fixtures as forecast in SPU’s Conservation Potential Assessment model; 1% Program Hardware – see individual program estimates from Section 3 of this report; System – analysis of 2002 system use; Drought Curtailment – analysis of 1992 post-drought experience; Economy – statistical analysis of the impact of changes in employment on commercial water consumption over the period 1987 through 2002; 1% Program Behavior – residual savings derived from all other savings.

Chart 9 shows per capita use back to 1975, illustrating that until the late 1980’s, per capita use was on the rise. Since then, with increased emphasis on conservation, per capita use has been steadily decreasing. As in 1992, the year 2001 saw a dramatic (though not of 1992 magnitude) one-year decline in water use. However, as again was the case in 1992, a good part of those savings are short-term transitory reductions in use which will erode over a few years’ time. The estimate of the future of those transitory savings is shown on Chart 9 (dotted line in circle). The 1% Program target for per capita consumption is shown as the dashed line. As the chart shows, the 2002 per capita consumption is well below the 2002 Target for the 1% Program.

**Chart 9: Regional Billed Per Capita Consumption**



From a long-term conservation perspective, the transitory savings from the 2001 and 2002 droughts may be viewed as achieving some of the behavioral savings that were to be gradually obtained over the next ten years. Continuation of long-term behavior programs will convert some of those transitory savings to long-term customer savings. In addition, investments in long-lived hardware, fixture and technology programs can continue to be emphasized in order to proceed toward the 1% Program long-term water use goals.